

## METAL SHEET PRESSING METHOD

### BACKGROUND OF THE INVENTION

#### Field of the Invention

The present invention relates to a method for pressing a steel sheet and more particularly to improvement of a pressing method for pressing a fragile portion of a steel sheet.

#### Description of Prior Art

As a conventional method for pressing a metal sheet such as steel sheet, it has been well known that a thin steel sheet is placed on dies and pressed with a punch into a product configuration.

The above-mentioned pressing method with the punch has various inconveniences described below and therefore, means for solving these problems has been demanded.

That is, a formation method of pressing with the punch comprised of simple processes is not good at formation of a complicated uneven-surface shape. To cope with this problem, it is necessary, for example, to retard pressing speed extremely or deepen the formation gradually through multiple pressing steps.

This problem is particularly remarkable in formation of a fragile portion in which a narrow frame or meshes are formed. In the case where such a fragile portion is formed according to the formation method of pressing with a punch, work efficiency

and formation efficiency drop largely.

In the case of forming a fragile portion having the narrow frame or meshes into an uneven-surface shape according to the method of pressing with the punch, actually, such a form as the narrow frame, meshes is punched out and then, a final product is drawn gradually through several steps using multiple dies each having a different degree of unevenness.

Even if such a press work with a great deal of labor and time is conducted, an uniform shape in that fragile portion cannot be maintained and it is difficult to draw a target material into a correct shape with a uniform thickness. Further, because a partial fracture or the like is likely to occur, the percentage of defects and manufacturing cost are increased.

#### SUMMARY OF THE INVENTION

In view of the above-described defects of the conventional method which needs a great deal of time and labor, an object of the present invention is to provide a metal sheet pressing method of pressing a metal sheet into an uneven-surface shape with press dies, in which a precision pressing work can be done with ease. Particularly, the present invention aims at providing a pressing method capable of pressing only a fragile portion so as to form an uneven-surface shape accurately when a metal sheet is subjected to precision-pressing work.

The metal sheet pressing method of precision-pressing the

metal sheet proposed by the present invention to achieve the above-described object will be described with reference to the accompanying drawings. That is, after a metal sheet 1 is partially drawn so as to form a perforated portion 1a, the perforated portion 1a is heated by baking and after it is heated by baking, the perforated portion 1a is pressed with press dies 3a, 3b into an uneven-surface shape.

The perforated portion 1a of the metal sheet 1 can be formed into a mesh-like shape as shown in Fig. 1.

According to the present invention, when the metal sheet 1 is precision-pressed, only a fragile portion such as the perforated portion 1a formed by drawing is heated by baking as shown in Fig. 3. Next, as shown in Fig. 4, the fragile portion after heated by baking is pressed with press dies 3a, 3b having an uneven-surface shape corresponding to the uneven-surface shape 1b (shown in Fig. 2) to be finally formed. Consequently, the fragile portion can be stretched uniformly and largely through a single process. Consequently, uneven-surface shape can be formed accurately. As a result, a metal sheet pressing method by which uneven-surface shape can be formed accurately without any formation defect is achieved. And, according to this method, forming speed can be reduced.

As a metal sheet to be pressed, steel sheet, stainless steel sheet and the like can be employed. Namely, common steel, austenitic base stainless steel, ferrite base stainless steel,

martensite stainless steel, two-phase stainless steel and the like can be employed.

According to the present invention, after the metal sheet is partially drawn so as to form the perforated portion, the perforated portion is heated by baking and after it is heated by baking, the perforated portion is pressed with press dies into a desired uneven-surface shape. As a steel sheet to be adopted as that metal sheet, it is preferable to use a steel sheet whose property is not changed despite annealing and which exerts the same characteristic as before heating after it is cooled. The before described austenitic base stainless steel, ferrite base stainless steel, martensite stainless steel and two-phase stainless steel satisfy these requirements.

Heating of the perforated portion 1a by baking can be carried out at temperatures of 800 to 1,000°C with a heating unit such as a burner as shown in Fig. 3. At this time, preferably, the fragile portion such as the perforated portion 1a formed by drawing is heated accurately by baking. Then, as a good measure for this purpose, a fence 4 is provided as shown in Fig. 3 to protect a flame of the heating unit 2 from swinging.

As described above, according to the present invention, only the fragile portion in the metal sheet formed by drawing is heated by baking, so that the uneven-surface shape can be formed precisely and easily by pressing. Consequently, the fragile portion in which a frame or meshes are formed by drawing

can be stretched accurately into a proper shape with a uniform thickness and formed into an uneven-surface shape of a desired size. Consequently, productivity is improved and further, percentage of defects can be reduced.

#### BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 is a plan view for explaining a state in which a metal sheet is partially drawn;

Fig. 2 is a sectional view taken along the line A-A of a metal sheet pressed according to the method of the present invention;

Fig. 3 is a sectional view taken along the line A-A in Fig. 1 for explaining heating process by baking; and

Fig. 4 is a sectional view taken along the line A-A in Fig. 1 for explaining a process of pressing a fragile portion after the heating process by baking.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, the preferred embodiment of the present invention will be described with reference to the accompanying drawings.

When an austenitic base stainless steel sheet having a thickness of 0.5 t is formed by drawing into a desired product shape as shown in Fig. 1, its perforated portion 1a is formed into meshes about 5 mm.

Only the perforated portion 1a formed in the mesh form is heated by baking locally to approximately 800 to 1,000°C with a heating unit 2 such as a gas burner as shown in Fig. 3.

According to the embodiment shown in Fig. 3, a fence 4 is provided to prevent a flame from the heating unit 2 from swinging so that only the perforated portion 1a is heated accurately by baking.

After that, as shown in Fig. 4, by using pressing dies 3a, 3b corresponding to an uneven-surface shape to be formed finally as shown in Fig. 2, the perforated portion 1a, after heated by baking, is pressed into a protruded form having a radius of about 50 mm. Since at this time, other portion than the perforated portion 1a subjected to heat treatment by baking is not heated, the other portion than the perforated portion 1a maintains its proper shape as a frame so as to form an uneven-surface shape accurately when the perforated portion 1a is pressed.

Consequently, a product in which the perforated portion 1a, which is the fragile portion, is formed such that it is largely protruded can be formed as shown in Fig. 2.

In the foregoing, preferable embodiment of the present invention is described, but the present invention is not limited to the above-described embodiment and can be carried out in various modes within the technical scope described in the claims.